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July twenty-eighth, eighteen hundred and sixty-six, shall be the tables of equivalents which may be lawfully used for computing, determining, and expressing in customary weights and measures the weights and measures of the metric system."

IMPROVED BLACKBOARD.

EDITOR OF SCIENCE: Several persons have enquired about the blackboard mentioned in your columns recently. May I describe it briefly: A sheet of ground glass a meter square is framed and the frame is hinged into a very shallow cupboard fastened to the wall. A false bottom covered with padded serge fits this cupboard loosely, and when the door is closed and fastened presses firmly against the glass on the inside. It then forms a fine blackboard as the ground glass surface is perfect for use with crayons.

If the door be opened and a sheet of white paper fastened to the false bottom by thumb tacks, it becomes an equally useful drawing slate for colored crayons. If in the place of the white paper a sheet of drawings as of crystal forms or geometrical figures, or outline maps be put behind the glass they show through so that all modifications of the primary form beneath can be drawn on the glass and in proper relation to this primary. It is only needful that the false bottom shall press firmly against the glass, and this is easily effected by having it held in place by four screws placed near the corners whose heads are countersunk in the false bottom. The latter moves freely on these screws and four spiral springs which are slid on the screws behind it press the serge firmly against the glass.

BEN. K. EMERSON.

AMHERST, MASS., January 14, 1896.

SCIENTIFIC LITERATURE.

Elementary Physical Geography. By RALPH S. TARR. 12 mo., pp. 1-xxxl., 1-488, 29 plates and charts, 267 diagrams and photographs. Macmillan & Co. 1895. Price \$1.40.

Physical geography is no longer a mere description of the earth's surface, but includes also an enquiry as to how its features came to be what they are. The recent ideas that have vivified this study and placed it on a scientific

basis may be seen by contrasting the writings of Ritter, Humboldt, Guyot and others of what may in all courtesy be termed the old school, with the book before us. In the older books, which are by many persons still considered fountains of geographical knowledge, the leading theme is the description of the earth; in Tarr's physical geography the dominant idea is how the features of the earth came to have their present characteristics.

In descriptive physical geography the continents are sometimes treated as fragments of broken china, which, by the exercise of much ingenuity and an active imagination, are made to fit together with more or less accuracy, thus leading the student to fancy that at one time they were united. In rational physical geography each continent is shown to have a life history, and to have been modified by elevation and subsidence, and varied in relief by erosion and sedimentation. In the modern view of nature even the largest of land masses are found to be unstable forms; the processes to which they owe their elevation above the sea, as well as their outlines and relief, are still active, and additional changes are to come. Mountains are no longer to be studied as finished forms, but as representing all stages of growth, adolescence, maturity and old age. River valleys are not merely drainage canals, the lengths and breadths of which are to be memorized, but each one has a history written in its terraces and flood plains, in which evidences of elevation and depression of the land, climatic changes, the influence of rock structure, etc., can be read.

The modern ideas referred to, which, so to speak, have blown away the mist from the landscape and revealed its varied beauties, are truthfully reflected in the book before us. One who is familiar with the progress of geological study in America sees, as he turns its pages, an epitome of the results brought by many conscientious workers from the mountains and valleys, with much labor and thought. Most of all, it is flavored with the studies of Prof. Davis, of Harvard, in whose class room and from whose writings Prof. Tarr has gained much of his inspiration. The great sources both of facts and ideas, as must of necessity be the case in

all attempts to write the physical history of North America, with which the book is mainly concerned, are the reports of the geological surveys of Canada, the United States, and of many individual States. The results of these great surveys reach the people and the schoolroom directly, to only a comparatively limited extent; probably their greatest popular usefulness lies in the fact that they are mines of wealth to those who attempt to popularize and disseminate scientific knowledge.

Physical geography is treated by Prof. Tarr under three leading topics : *The Air, The Ocean, The Land.*

The Air : The part treating of the air begins with an account of the relations of the earth to other members of the solar system and is in fact an introduction to the entire subject of physical geography. This chapter probably differs less than any other portion of the book from older treatises on the same subject. Necessarily the subject-matter to a great extent is borrowed from astronomy.

The discussion of atmospheric temperatures, moisture, condensation, clouds, etc., the nature and origin of storms, distribution and characteristics of climate and other similar phenomena, brings out the results of the most recent studies in this important branch of the subject. To a great extent these chapters are a compend of Davis' Meteorology, a book that should be at hand when instruction in this portion of the subject is given.

The Ocean : In dealing with the geography of the sea, the rich store of knowledge resulting from the Challenger, and other similar expeditions, furnishes the data for presenting a comprehensive outline of the results of recent surveys. Some of the subdivisions of the subject as treated are : methods of deep-sea explorations ; topography of the sea bottom and of coast lines ; deposits now forming on the sea floor ; temperatures ; chemical composition, circulation, etc., of sea waters ; general distribution of life in the sea ; the causes of currents and tides ; and the effect of the movements of sea water are discussed and illustrated by diagrams, maps and photographs.

The Land : It is in this portion of the book that the greatest advances, both in geography

as a science and in methods of study, are shown. The processes by which the rocks forming the land are disintegrated and carried away are discussed and the resulting changes in topography clearly described. The fact that all rocks which rise above sea level are constantly yielding to chemical and mechanical agencies and being removed by streams in solution and suspension leads to the recognition of a fundamental principle, first definitely stated by Major Powell, which is of wide application in both geography and geology. This tendency to reduce all land areas to the level of the sea, or to *baselevel*, as it is termed, if not counteracted by movements of elevation, will result in the production of plains. Such plains of subaerial denudation, or *peneplains*, are a characteristic feature of many regions.

A knowledge of the way in which streams deepen and broaden their valleys, and slowly adjust themselves to rock structure, gives meaning to a multitude of geographic forms, that would otherwise appeal to the eye alone without awakening a mental picture of the long series of changes of which they are the result.

The deposition of the waste of the land in flood plains and deltas, and its distribution over the bottoms of lakes and on the ocean's floor, illustrates other phases of the never-ending changes that attract the eye of the geographer. These wide reaching processes and the character of the results they produce are tersely outlined.

The characteristics of glaciers and the changes they bring about in the topography of the land, both by erosion and deposition, form a chapter that cannot fail to awaken interest especially in the minds of students whose homes are in the northeastern States or Canada, since not only the general expression but almost every detail in the landscape with which they are familiar is an inheritance from an ice invasion.

The study of coast lines shows that the agencies by which the relief of the surface of the land is modified are supplemented by analogous agencies which are constantly altering the direction and varying the details of the margins of continents and islands.

Many of the results of erosion and deposition are illustrated by home example and supplemented by photographs of American scenery.

The book is emphatically an American book, and especially well adapted for American students.

A chapter is devoted to volcanoes, earthquakes, geysers; another to the general topography of the land. The relations of man to his environment, and the products of the rocks that are of leading economic importance, are also considered as fully as the space available will allow.

An important feature of the book, and one that places it in advance of all other similar treatises, is the free and one might say almost lavish use of photographs. While some of them are so much reduced and so poorly printed that they have lost their beauty, and are even obscure and of little value, yet the preference, in many instances, of photographs over sketches and wood engravings for text-book use is thoroughly demonstrated.

At the close of each chapter there is a short list of books which will aid the teacher in extending the subjects outlined in the text, and enable him to add fresh description and discussions from authoritative sources.

Now that a text-book of rational physical geography, designed for school-room use, is available, which presents the modern aspects of the subject as well, perhaps, as could be done in an elementary treatise, there is no longer an excuse for practically excluding this attractive and stimulating branch of nature study from our schools. It has frequently been stated that it is useless to attempt to teach physical geography in its modern dress, for the reason that properly trained teachers were not available. With Tarr's book in hand and works of reference available, there is no reason why many graduates of normal schools and colleges should not prepare themselves for this work. Without, however, a certain indescribable sympathy with nature, a deep appreciation of the beauties of form and color in a landscape, and a quenchless thirst to know how the numberless features of the land, sea and sky came to be what we find them, one need not expect great success as a teacher of physical geography. Given a love of nature and such a guide-book as Prof. Tarr has compiled, and the path leading to the commanding height from which the

history of the earth's surface can be read as from a printed page may be readily reached.

Necessary adjuncts to a text-book of physical geography, are maps, especially of the region where the teacher is located, large-sized photographs or lantern views, globes, models, etc. These appliances, however, are of comparatively little use, unless, as expressed by Davis, 'the oversight is aided by the insight.'

In closing I wish to say, as has been stated in the report on a recent conference in geography, that the study of physical geography demands an advanced position in both school and college training, for the reason that it develops the power of observation, the powers of scientific imagination, and the power of reasoning.

ISRAEL C. RUSSELL.

The Great Frozen Land: Narrative of a winter journey across the Tundras and a sojourn among the Samoyads. By FREDERICK GEORGE JACKSON. Macmillan & Co., New York. 1895.

In this pleasantly written and by no means over-scientific volume, the leader of the Jackson-Harmsworth Polar Expedition (now passing its second winter in the region of Franz Josef Land) gives the narrative of a long sledge-journey across the frozen lands of northern Russia, from the Yugor Strait to the Varanger Fjord—a journey undertaken primarily with a view of testing certain requirements of travel which might be found necessary in the more arduous Polarctic work for which the author had been preparing. The land-traverse compassed some twenty-five hundred miles across the Great and Little Tundras, and over a solitude, as stated in the prefatory remarks of Mr. Montefiore, 'through which no Englishman had ever passed; of which no sufficient map existed; whose table of river-labyrinths, ancient beaches and lost bays had never been told; of whose winter climate no account was to be discovered in the English tongue.' Just why these deficiencies in English knowledge and energy are so strongly emphasized does not appear clear, and it can, perhaps, hardly be said that Mr. Jackson's travels acquire importance through them alone.

There is much in this book to interest the general reader, and particularly acceptable are